Mobile Communication

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1. Classify the mobile radio transmission systems.
   Simplex & Duplex.

2. State example for a half duplex system.
   Push to talk and release to listen.

3. State example for a Simplex system.
   Pager.

4. State the operations performed by control channel
   Call setup, call request, call initiation and other control purposes.

5. Define page.
   A brief message which is broadcast over the entire service area in a simulcast fashion by many base station at the same time.

6. Define the term Roamer.
   A mobile unit that operates in a service area other than that from which service has been subscribed.

1. Define handoff ?
When a mobile moves from one cell to another the control of this mobile is transferred from one cell to another. This process is referred as handoff.

7. Define cluster.
The N cells which collectively use the complete set of available frequencies is called a cluster.

8. Give the equation which illustrates the relation between capacity of a system and cluster size.
C = MKN

9. State the different classifications of channel assignment strategies.
Fixed and dynamic.

10. What is the use of RSSI ?
This is receive signal strength indicator. This information is sent to the cell site from the mobile unit so that the MTSO can decide for a handoff.

11. Mention the type of handoff used in CDMA.
Soft handoff.

12..State the different types of handoffs.
Soft handoff, hard handoff, forced handoff, delayed handoff and mobile associated handoff.

13.What is intersystem handoff ?
During a course of a call, if a mobile moves from one cellular system to a different cellular system controlled by a different MSC it is referred as intersystem handoff.

14.What is co channel interference ?
Interference between signals from cells that operate in same frequency is referred as channel interference.

15. What is grade of service ?
It is a measure of the ability of a user to access a trunked system during the busiest hour.

16. What is cell splitting ?
It is a process of subdividing a congested cell into smaller cells.

17. What is sectoring ?
The process of using directional antennas in a cell is referred as sectoring.

18. State the different techniques used for improving coverage and capacity in cellular systems.
Cell splitting, Sectoring, Repeaters for range extension and Microcell zone.

19. Define modulation.
It is the process of encoding information from a message source in a manner suitable for transmission.

20. What is frequency planning ?

The design process of selecting and allocating channel groups for all the cellular base stations within a system is called frequency planning.

21. What is trunking efficiency ?

It is a measure of the number of users which can be offered a particular GOS with a particular configuration of fixed channels.

22. State the basic constituents of a cellular system.

Mobile unit, cell site, mobile telephone switching office.

23. State the two different types of fading.

Long term fading & short term fading.

24. Define rayleigh fading.

It refers to the variation in the received signal which is due to the waves reflected from surrounding buildings and other structures.

25. Define the term coherence bandwidth.

It is defined as the bandwidth in which either the amplitudes or the phases of two received signals have a high degree of similarity.

26. What is direct wave path ?

It is the path which is clear from the terrain contour.

27. State the different analog modulation schemes.

Amplitude and frequency modulation.

28. State the different modulation schemes.

Amplitude shift keying, frequency shift keying, phase shift keying.

29. Define amplitude modulation.

The amplitude of the high frequency carried is varied in accordance to the instantaneous amplitude of the message signal.

30. State the techniques used for SSB generation.

Filter method and balanced modulator method.

31. State the advantages of digital modulation schemes.

Power efficiency and bandwidth efficiency.

32. Define bandwidth efficiency.

It describes the ability of the modulation scheme to accommodate data within a limited bandwidth.

33. Define Power efficiency.

It describes the ability of the modulation scheme to preserve the fidelity of the digital message at low power levels.

34. State the different types of line coding.

Return to zero, non-return to zero and Manchester.

35. State the types of modulation schemes used in mobile communication.

GMSK, GFSK and DQPSK.

36. What is coherent detector ?

If the receiver has prior knowledge of the transmitted signal then the receiver is known as coherent detector.

37. State the advantage of using GMSK rather than MSK.

The bandwidth occupied by GMSK modulated signal is less in comparison to MSK modulated signal.

38. What is CPFSK ?

Continuous phase frequency shift keying. It is another name for MSK.

39. What is QAM ?

Quadrature amplitude modulation.

40. State the difference between MSK and GMSK.

GMSK uses a Gaussian pulse shaping filter prior to MSK.

41. What is a diversity receiver?

Diversity receiver is the diversity scheme applied at the receiver end of the antenna in all effective technique for reducing interference, where selective combiner is used to combine two-correlated signal.

42. Expand PCS, PLMR, NLOS and DECT.

PCS - Personal Communication Systems.
PLMR – Public Land Mobile Radio
NLOS – Non Line Of Sight
DECT – Digital Equipment Cordless Telephone

43. Mention the three partially separable effects of radio propagation.

The three partially separable effects of radio propagation are,

Multi path fading
Shadowing
Path loss

44. Mention the basic propagation mechanisms, which impact propagation in mobile communication.

The basic propagation mechanisms are,

Reflection
Diffraction
Scattering

45. What is reflection?

Reflection occurs when a propagating electromagnetic wave impinges upon an object, which has very large dimension when compared to the wavelength of propagating wave.

46. What is diffraction?

Diffraction occurs when the radio path between the transmitter and receiver is obstructed by a surface that has sharp irregularities.

47. What is scattering?

Scattering occurs when the medium through which the wave travels consists of objects with dimensions that are small compared to the wavelength and where the number of obstacles per unit volume is large.

48. Define Brewster angle?

The Brewster angle is the angle at which no reflection occurs in the medium of origin. It occurs when the incident angle θ b is such that the reflection coefficient Is equal to zero.

49. Why we use 1mi intercept for mobile communication?

Within a 1mi radius the antenna beam width of a high gain omni-directional antenna is narrow in vertical plan. Larger the elevation angle weaker the reception level.

50. What are the possible conditions in a point-to-point prediction model?

The possible conditions in a point to point prediction model are,

Non Obstructive direct path.

Obstructive direct path.

51. What are the merits of point-to-point model?

The merits are,

Produces an accurate prediction with a deviation of 8dB.

Reduces the uncertainty range by including the detailed terrain contour information.

52. What is a smart antenna?

A smart antenna system consist of an antenna array, associated RF hardware and a computer controller that changes array pattern in response to radio frequency environment.

53. What is EIRP?

Effective isotropic radiated power is referenced to an isotropic source. The difference between ERP and EIRP is 2dB

ERP=EIRP-2dB

54) What is PHP?

PHP means Personal Handy Phone System. It is otherwise called PHS. PHP is a wireless communication TDD System which supports personal communication services (PCS). It uses small, low-complexity light weight terminals called Personal Stations (PSS).

55) Write down the applications of PHP?

PHP can be used for,

* Public Telephone
* Wireless PBX
* Home Cordless Telephone
* Walkie – talkie communication.

56 Features of PHP?

* Wider Coverage per cell.
* Operation in a mobile Outdoor environment,
* Faster and distributed control of handoffs.
* Enhanced authentication
* Encryption
* Privacy
* Circuit and packet-oriented data services.

57) What are the logical channels that the control channel consists?

* Broadcast control channel.
* Common control channel.
* User packet channel.
* Associated control channel.

58) What is BCCH?

Broadcast control channel is a one way down link channel for broadcasting control information from CS to PS.

59) What is CCCH?

CCCH is Common Control Channel Which sends out the control information for call connection.

60) What is SIM?

SIM, which is memory device that store information such as the subscriber identity number, the network and countries where the subscriber is entitled to service, private key, and other user specified information.

61) What are main subsystems of GSM architecture?

i) Base station subsystem (BSS)
ii) Network &switching subsystem (NSS)
iii) Operation support subsystem (OSS)

62) What are frequencies used in forward and reverse link frequency in GSM?

(890-915) MHz- reverse link frequency
(935-960) MHz-forward link frequency

63) What are the channel types of GSM system?

i) GSM traffic channel
ii) GSM control channel
1. Broad cost channel
2. Common control channel
3. Dedicated control channel

64) What is CDMA digital cellar standard (is 95)?

IS-95- interim standard

IS 95 allows each user with in the a cell to use the same radio channel and user in adjacent cell also use the same radio channel since this is a direct sequence spread spectrum CDMA system.

65) What are frequencies used in forward and reverse link frequency in IS-95?

(824-849) MHz- reverse link frequency
(869-894) MHz-forward link frequency

66) If a cellular operator is allocated 12.5 MHz for each simple's band and if b_t is 12.5 MHz b_{guard} is 10 KHz & B_c=10khz find the number of channel available in an FDMA system.

$N= (b_t - 2\, b_{guard}) / B_c$
N=(12.5 MHz-2(10 KHz))/ 10khz
=416channel

76. State certain access technologies used in mobile satellite communication systems.

FDMA, TDMA and CDMA.

77 State the different types of handoffs.

Soft handoff, hard handoff, forced handoff, delayed handoff and mobile associated handoff.

78. What is intersystem handoff ?

During a course of a call, if a mobile moves from one cellular system to a different cellular system controlled by a different MSC it is referred as intersystem handoff.

79. State the expression that relates co channel reuse ratio (Q) to radius (R) of a cell

$$Q = D/R$$

D – Distance between center of co channel cells

80. State the expression used to locate co channel cells.

$N = i^2 + ij + j^2$

81. Define the term dwell time.

The time over which a call may be maintained within a cell without handoff.

82. State the advantage of umbrella cell approach.

It provides large area coverage to high speed users while providing small area coverage to users traveling at low speeds.

84. Define co channel cells.

The cells that operate with the same set of frequencies are referred as co channel cells.

85. Define the term Erlong.

One Erlong represents the amount of traffic intensity carried by a channel that is completely occupied.

86. State the relation between traffic intensity (A_u) and holding time (H).

$A_u = \lambda H$.

λ = request rate

87. State the two types of trunked system.

Blocked call cleared system and Delayed call cleared system

88.How many co channel interferes are present in the first tier for a cluster size of 7?

Six

89.What is CDPD?

CDPD is a Cellular packet digital Data System that uses packet switched data .The bit rate in the RF channel for CDPD is !9.2kbps

90.Write some features of TDMA?

*In TDMA , no. of time slots depends upon modulation technique ,available bandwidth

*Data transmission occurs in bursts

- It uses different time slots for transmission and reception, then duplexers are not required

- Adaptive equalization is necessary
- Guard time should be minimized

91Write some features of CDMA?
*In CDMA system, many users share the same frequency either TDD or FDD may be used
*Channel data rate is high
*Multipath fading may be substantially reduced
*CDMA uses co –channel cells, it can use macroscopic spatial diversity to provide soft hand off

92.Write the features of DECT?

- DECT provides a cordless communication framework for high traffic intensity, short range telecommunication and covers a broad range of applications and environment
- It supports telepoint services
- It provides low power radio access between portable parts and fixed base station's at ranges of upto a few hundred meters
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93.What are the interfaces used in the GSM?
GSM radio air interface
Abis interface
A interface

94.What are the types of services in GSM?
Tele sevices and Data services

95.Write some third generation wireless standards.
Personal communication system
IMT-2000
UMTS

96.What is Bluetooth?
It is an open standard that provides an ad-hoc approach for enabling various devices to communicate with one another within nominal 10 meter range. It operates in the 2.4 Ghz ISM band and uses frequency hopping TDD scheme for each radio channel

97.What is the forward and reverse link frequency for AMPS?
(890-915) MHz- reverse link frequency
(935-960) MHz-forward link frequency

98.Write the specifications of DECT ?
Frequency band –1880-1900Mhz
No. of carriers - 10
RF channel bandwidth -1.728MHz
Multiplexing –FDMA/TDMA
Duplex-TDD
99.What is near-far effect in wireless network?

When used with FM or spread spectrum modulation, it is possible for the strongest user to successfully capture the intended receiver , even when many users are also transmitting . If the closest transmitter is able to capture a receiver because of small propagation path loss, it is called as near -far effect in wireless network

100. Write some standards used in 2G system

GSM
IS-136
IS-95
Pacific Digital Cellular standard

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Part B Questions

1. Explain elaborately about types of handoffs.
   - Hard handoff
   - Soft handoff
   - Forced handoff
   - Delayed handoff
   - Mobile assisted handoff

2. Explain in detail about dropped call rate and cell splitting.
   - Definition of dropped call rate
   - Consideration of dropped calls
   - Relation ship among capacity, voice quality and dropped call rate
   - Formulae for dropped call rate
   - Diagram for cell splitting
   - Theory for cell splitting

3. Explain the different techniques of improving coverage and capacity in cellular system
   - Explanation about cell splitting
   - Explanation about sectoring
   - Explanation about Mirozone approach

4. Derive the expression for Erlang B and Erlag C formulas
   - Explanations about Blocked call cleared system and Delayed call cleared System
   - Derivation for Erlang B formula
   - Derivation for Erlang C formula

5. Explain in detail about usage of repeater for coverage improvement.
   - Repeaters
   - Usage in providing coverage.

6. Explain with neat diagram about a cell mobile telephone system.
   - Diagram
   - Explanation about MSC
   - Explanation about PSTN
   - Explanation about cell sites
   - Explanation about mobile units

Explanation about communication between cell sites, MSC and PSTN.

7. With the help of a neat diagram explain about frequency reuse and the advantages of it.
   Diagram
   Derivation for N=3, 7 and 12
   The advantages of frequency reuse
8. Explain in detail about Paging system and its operation.
   History
   Operation Procedure.

9. Explain elaborately the evolution of cellular systems.
   History behind cellular

10.With the help of timing diagram ,explain the process of call initiation in a cellular system.
   Timing diagram
   Explanation about call initiated by landline subscriber
   Explanation about call initiated by a mobile

11. Compare and contrast the features of FDMA,TDMA and CDMA
   Comparision based on
   Bandwidth
   Security
   Efficiency

12. With neat diagram explain the forward CDMA channel Structure

   Frequency Hopping
   Explanation
   Direct Sequence

13.Explain the Free space propacation model?
14.What is the non linear equalization? Explain the three non linear methods of equlization with suitable diagrams?
15.Draw the block diagram of LPC coding system and explain the different types

of LPC used for wireless systems?
16.With suitable block diagram explain the GSM system?
17.Explain the concepts of CDMA. What are its merits and demerits? Explain the working principle of RAKE receiver.
18.Explain the TDMA frame structure and derive the efficiency of a TDMA system
19.Explain detail about DECT?
20.Explain detail about IS-95
21.Write about the GMSK transmitter and receiver with neat diagram?
22.With a diagram explain the performance of RAKE receiver?
23.Describe the impulse response for the a multipath radio channel?
24.Explain the two ray ground reflection model and obtain an expression for the received power at a distance'd'from the transmitter?
25.Enumerate the fandamental of equalization and reduction in intersymbol interference in communication channels.